

Graphene Based Materials towards Post-AI Era: Smart Fibers, Soft Robotics & Single Atom Catalysts

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Successive discoveries of intriguing 2D materials, including graphene, 2D TMDs and MXene, have raised significant scientific and technological attentions principally motivated from their outstanding and versatile material properties, stemming from the genuine 2D confined geometry. Continuously increasing library of 2D materials can offer valuable opportunities to tackle critical challenges underlying in the current technological trend of the 4th industrial revolution. This invited presentation highlights three specific emerging application areas of 2D graphene: smart fibers, soft robotics and single atom catalysts, which hold immense potentials for the future technological advancements in the post-AI era. Smart fibers showcase novel versatile functionalities in traditional 1D fiber like geometry, including healthcare/environmental monitoring, energy storage/harvesting and antipathogenic protection in the forms of wearable fibers and textiles. Soft robotics aligns with the future trend to overcome longstanding limitations of the hard-material based mechanical components by introducing soft material based actuators and sensors. Single atom catalysts are widely useful in energy storage/conversion and environmental management, principally contributing to low carbon footprint for sustainable post-AI era. We highlight significance and widely open potentials of 2D materials in these emerging applications, where our research group has devoted research efforts for more than a decade.